

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

L.O. Scade: 22.10.05

## PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY  
(PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/B2004/004253 ✓

International filing date (day/month/year)  
22.12.2004 ✓

Priority date (day/month/year)  
22.12.2003 ✓

International Patent Classification (IPC) or both national classification and IPC  
G01N21/33, G01N21/31, H01L31/0264, H01L31/0352

Applicant  
INFM ISTITUTO NAZIONALE PER LA FISICA DELLA ... ✓

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**International application No.  
PCT/IB2004/004253

iAP20 Rec'd PCT/PTO 21 JUN 2006

**Box No. I Basis of the opinion**

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material:
    - ☐ in written format
    - ☐ in computer readable form
  - c. time of filing/furnishing:
    - ☐ contained in the international application as filed.
    - ☐ filed together with the international application in computer readable form.
    - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**Box No. II Priority**

1. ☒ The validity of the priority claim has not been considered because the International Searching Authority does not have in its possession a copy of the earlier application whose priority has been claimed or, where required, a translation of that earlier application. This opinion has nevertheless been established on the assumption that the relevant date (Rules 43*bis*.1 and 64.1) is the claimed priority date.
2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/IB2004/004253

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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-22
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-22
Industrial applicability (IA)	Yes: Claims	1-22
	No: Claims	

2. Citations and explanations

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING  
AUTHORITY (SEPARATE SHEET)**

10/204020  
iAP20 Rec'd PCT/PTO 21 JUN 2006  
International application No.

PCT/IB2004/004253

**Re Item V**

1. Reference is made to the following documents:

- D1: US-A-4 796 590
- D2: MORKOC H: "Potential applications of III-V nitride semiconductors" MAT. SCI. AND ENG. B, vol. 43, no. 1-3, 1997, pp.137-146, XP004073412
- D3: MORKOC H ET AL: "GaN-based modulation doped FETs and UV detectors" SOLID STATE EL., vol. 46, no. 2, (2002-02), pages 157-202, XP004330888
- D4: POTI' ET AL: "High responsivity GaN-based UV detectors" ELECTR. LETT., IEE, vol. 39, no. 24,(2003-11-27), pages 1747-1749, XP006024489
- D5: HENINI M: "III-V nitrides for electronic and UV applications" III VS REVIEW, vol. 12, no. 5, (1999-09), pp. 28,30-32, XP004189082
- D6: STRITE S ET AL: "PROGRESS AND PROSPECTS FOR GAN AND THE III-V NITRIDE SEMICONDUCTORS" THIN SOLID FILMS, vol. 231, no. 1 / 2, (1993-08-25), pages 197-210, XP000393378
- D7: STRITE S ET AL: "GAN, AIN, AND INN: A REVIEW" J. VAC. SCI. AND TECH., B, vol. 10, no. 4, (1992-07-01), pp. 1237-1266, XP000296477
- D8: US-A-4 614 961
- D9: SCHERER A ET AL: "InGaAsP photonic band gap crystal membrane microresonators" J. OF VAC. SCI. & TECH. B vol. 16, no. 6, pp. 3906-3910, XP012007308
- D10: MONROY E ET AL: "AlGaN-based UV photodetectors" J. OF CRYSTAL GROWTH, vol. 230, no. 3-4, S(2001-09), pages 537-543, XP004296567
- D11: US-A-5 278 435

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 does not involve an inventive step in the sense of Article 33(3) PCT.
- 2.1 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses (the references in parentheses applying to this document): an optical system for detecting the concentration of gaseous species, comprising at least one source of ultraviolet and/or visible radiation (6) and a photodetector device

(11) opposite that source, between which there flows a gaseous mixture (col.3, ll.20-23) whereby said photodetector device is adapted to detect the concentration of the gaseous species present in the mixture through detecting the spectrum emitted by said source modified through the combined absorption and emission effect of said gaseous species (col.2, ll.54-59).

- 2.2 The subject-matter of claim 1 therefore differs from this known optical system in that the photodetector device comprises an active material based on gallium nitride (GaN), aluminium nitride (AlN) or indium nitride (InN) and corresponding alloys.
- 2.3 The problem to be solved by the present invention may therefore be regarded as choosing an UV detector that can be used at high temperatures (cf. also application, p. 3, § 1 and 2)
- 2.4 The solution proposed in claim 1 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) because the skilled man, looking for a heat-resistant UV detector, would learn from any of documents D2, D3, D4 or D5 that GaN, AlN or InN-based photodetectors are particularly suitable for applications in high-temperature, harsh environment and would use one or more of such photodetectors in the optical system of D1 thus arriving at the subject-matter of claim 1 without making use of an inventive step.
3. Dependent claims 2-22 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, for the following reasons:
  - 3.1 Claims 2, 5, 20: obvious feature for the skilled man;
  - 3.2 Claims 3, 6, 7, 8: cf. D6, disclosing alloys of the claimed substances and quantum well structures;
  - 3.3 Claim 4: cf. D9, disclosing a photonic crystal resonator;
  - 3.4 Claims 9-13 and 16-19: standard methods of producing the photodetectors, cf. also

D7, D8, D9 and D11;

3.5 Claims 14, 15: cf. D10, fig. 1 and D11, fig. 3;

3.6 Claim 21: known from D1;

3.7 Claim 22: obvious alternative to the cooling system proposed in D1.

**Re Item VIII**

The requirements of Art. 6 PCT are not met for the following reasons:

1. Claim 1, last part, and claim 2, last part relate to the desired effect and/or to the working principle of the optical system rather than defining further technical features thereof.
2. Claim 5: the first feature is redundant as it is already known from claim 1, while the second feature seems to be a feature of the use of the optical system.
3. Claims 9-13, 17 and 19, though dependent on a device claim, appear to relate rather to the manufacturing method of the photodetector.